15¢

JULY 17, 1948

SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE

"Eye-Dropper" Technique

See Page 40

A SCIENCE SERVICE PUBLICATION

$5.50 A YEAR VOL. 54 NO. 3

MEDICINE

New Typhoid Remedy

Chloromycetin, which is extracted from a mold, will bring the fever of patients with this disease to normal within three days. Not available at present.

➤ TYPHOID FEVER patients next fall or early winter may get a new medicine which will bring their fever to normal in three days instead of the usual three or four weeks. But right now there is not an ounce of the precious new drug available anywhere.

The drug is chloromycetin. Like penicillin, it was extracted from a mold. But, unlike penicillin and streptomycin, it is a potent remedy for both typhoid fever and the quite different disease, scrub typhus, which attacked more than 6,000 American troops during the Pacific campaign in the last war. Neither penicillin nor streptomycin is effective in these two diseases, nor has any other drug been as effective against them.

Results of the first field test of the new drug as a remedy for scrub typhus were reported by Dr. Joseph E. Smadel of the Army Medical Department Research and Graduate School. He has just returned from Kuala Lumpur, Federation of Malaya, where he headed the Army's scrub typhus research unit. With him in the unit were Dr. Theodore E. Woodward of the University of Maryland, Col. Cornelius B. Philip, U. S. Public Health Service and Maj. Robert Traub and Lt. Herbert L. Ley of the Army's Research and Graduate School.

All 40 of the scrub typhus patients treated with the new drug recovered. So did all 11 typhoid fever patients, though two of these were so sick, with hemorrhages and perforated intestines, that by all the previously known odds they should have died.

The discovery of the drug's effectiveness as a typhoid remedy was made by accident. In the early stages, scrub typhus cannot always be diagnosed exactly. So two patients thought to have this Pacific disease were treated with chloromycetin before the doctors could know that actually they had the entirely different typhoid fever.

Chloromycetin was obtained in crude form, from a mold in soil from Caracas, Venezuela, by Dr. Paul Burkholder of Yale. Scientists at Parke, Davis and Co. worked with it and obtained it in crystalline form. They are so far the only company making it and they have only made it on a laboratory scale for preliminary testing. Recently Dr. Smadel asked for three more ounces to send to Kuala Lumpur to finish the trials there.

The company said it had none left. Then after quite a search the three ounces were found in a chemical laboratory awaiting analysis. This precious last bit was sent to Malaya.

There won't be any more, Dr. Smadel was assured, until fall or early winter, by which time larger-scale production will be under way. Then there should be enough for further research and for treatment of a limited number of scrub typhus patients in Malaya and typhoid fever patients in the United States. Recalling the long periods before penicillin and streptomycin became available, Dr. Smadel considers the promise of a fall supply a remarkable achievement.

International goodwill note: Dr. Smadel stressed the excellent cooperation from not only British scientists at the Institute for Medical Research, Kuala Lumpur, but also that from the Malayan government. The government, he reported, returned to his unit the 70 cents per gallon gasoline tax on all gas the unit's two jeeps used, besides giving other assistance.

Science News Letter, July 17, 1948

MEDICINE

Polio Clues in Environment

➤ TO FIND new clues for solving the polio problem, look into the way of life, the soil, water, diet and other factors of the environment. Do this in regions of the world that have had very little infantile paralysis for several decades.

Something as useful for polio fighting as the discovery of the relation between fluorine in drinking water and tooth decay might be turned up from such a systematic search.

This, in brief, is the advice given the world's polio fighters by Dr. Albert B. Sabin, University of Cincinnati, at the opening of the First International Poliomyelitis Conference in New York.

Infantile paralysis, as it used to be called, is becoming "less and less infantile in many parts of the world," Dr. Sabin found in one of the most complete international surveys of the disease.

In 1916, 3.7% of polio victims in cities in the United States were over 15 years of age. Today, 25% are over 15. More than half (53%) of cases in Copenhagen in 1944 were over 15.

The theories that improved sanitation and resistance acquired through unnoticed exposure to the disease explain the change in age at which it is attacking are pretty well debunked by Dr. Sabin's analysis. So he suggests looking for more subtle factors in the environment.

The total amount of polio has probably not increased in the past 30 years in cities in the northern part of the world, Dr. Sabin said. The attack rates for the entire United States show no sign of a progressive increase from 1915 to 1939. And although there seems to have been more polio each year since 1940, the attack rate each year would not be higher than in the 1915-1919 and 1930-1939 periods if only paralytic cases were included. Probably 40% of the cases reported each year since 1940 are not paralytic, Dr. Sabin said.

Even without taking this into account, there is no sign whatever that the total amount of polio in New York City has been increasing in the past 30 years. In fact, if the reports are reduced by 40%, to make them comparable to 30 years ago when only paralytic cases were recognized, the overall risk of getting polio in New York has decreased since the 1910-1919 period.

Science News Letter, July 17, 1948

AERONAUTICS

Interchangeable Hulls Tested on Flying Boat

➤ INTERCHANGEABLE test hulls on a light-weight Naval amphibian plane are undergoing extensive flight and landing operations to determine which is best, particularly for use in rough water.

The tests are being made with a Navy Grumman J4F Widgeon, which has been modified so that the lower part of the hull on which it floats can be removed and replaced easily with other hulls of special designs by the use of bolts.

Present plans call for the testing of three different hulls which have been constructed as a result of research findings by the Stevens Institute of Technology, Hoboken, N. J., the National Advisory Committee for Aeronautics, Langley Field, Va., and the Glenn L. Martin Company of Baltimore.

The first hull to undergo rigid testing will be the elongated type now on the new Navy Martin XP5M-1, a patrol plane. The most striking feature of this is the length of its so-called afterbody. By extension of the hull bottom to the extreme end of the plane, a much longer base is provided which seems to lessen pitching and bouncing in rough water, protects the tail surface from waves, reduces the normal time and distance for takeoff, and makes landings less hazardous.

The hull being used on the Widgeon is a scaled-down reproduction of this Martin afterbody type. The second and third hulls to be tested will be the planing-tail type, designed by the National Advisory Committee for Aeronautics.

The plane for use with the various hulls has already been dubbed the "Petulant Porpoise."

Science News Letter, July 17, 1948

NUCLEAR PHYSICS

Superbomb Is Possible

Known basic reactions point to the possibility of a "hydrogen bomb" hundreds of times more violent than the present atomic bomb.

By WATSON DAVIS

➤ AN ATOMIC SUPERBOMB, a thousand times as violent as the present plutonium bombs, is definitely within the realm of possibility.

It would be made principally from the double-weight variety of the lightest chemical element, hydrogen. This isotope was discovered in America in 1931 and is called heavy hydrogen or deuterium (symbol D).

This is the "hydrogen bomb" that certain high officials in past months have vaguely, and possibly inadvisably, hinted may be made.

What, if anything, is being done by the U. S. Atomic Energy Commission about the construction of a deuterium superbomb is so far a secret, but the factual and theoretical basis of the hope for a new and more powerful bomb is no secret to anyone who can read the literature of physics and chemistry, even that earlier than 1940.

Basic Reactions

The basic reactions that point out the possibility of the superbomb are these: When two hearts or nuclei of heavy hydrogen (deuterons) come together there may be formed an ordinary hydrogen atom and a hydrogen atom of mass three (called tritium). Or the same coming together of D and D may also form a helium atom of mass three and a neutron. The important thing is that in each of these cases a sizable quantity of nuclear energy, due to conversion of mass into energy, is released. This amounts to 3,300,000 electron volts in each reaction.

You can find these reactions set forth in scientific articles published in 1935 in the *Proceedings of the Royal Society of London* and in *die Naturwissenschaften* (Germany).

The atomic energy released may appear at first sight to be small compared with that provided by the fission of the uranium or plutonium atom (which happens in the existing atomic bomb) which is 200,000,000 electron volts. But due to the fact that deuterium weighs only two, compared with uranium's 235, the energy available is very closely the same on a weight basis.

How to get the chain reaction started and kept going is a problem. In one sense it could be simpler for the heavy hydrogen bomb than the uranium-plutonium bomb. Neutrons, the neutral particles which are fundamental building blocks of atoms, are necessary to trigger and continue the fission of uranium or plutonium. No specially produced particles of this sort are necessary in the case of the superbomb. It is a matter of getting two deuterons together with enough speed and punch. The problems of doing this have not been worked out, so far as the literature shows.

Certainly the superbomb will require very careful attention to producing a high level of agitation of the atoms and a very speedy transfer of the energy and agitation to other atoms. It must all happen in a fraction of a microsecond. How big the bomb can be is also a question. The suggestion that it can be a thousand times or so the violence of the present fission bombs is based on the idea that it has no limits of size beyond which it must explode. There is a critical mass of the fission bomb beyond which it will explode and below which it won't. The superbomb size limitation is probably the amount of material that will react in the short time.

Since the energy-releasing reactions of deuterium bombardment were known long before the discovery of the fission of uranium in 1939, it is assumed that scientists must have thought of making deuterium bombs long before the uranium bombs were conceived. But the invention of the fission bombs may have solved the problem of getting a deuterium bomb started.

The trigger of a deuterium bomb might very well be the explosion of a fission bomb.

Combined Bomb

Because in one of the two D-D reactions a neutron is produced, it may prove practical to make a sort of combined deuterium-plutonium bomb, using the neutrons of the D-D reactions to fission plutonium.

For this reason, any competent chemist could tell you that the material of the superbomb might be a solid consisting of a chemical combination of plutonium and deuterium.

One dream of scientists has been the operation here on earth of the cycle of nuclear changes that maintains the heat of the sun. Dr. H. Bethe, now of Cornell and one of the world-renowned atomic physicists, has advanced a theory, now generally accepted, that carbon transforms into helium by six steps through nitrogen and oxygen with release of nuclear energy. Presumably this takes place only at very high temperatures and pressures. But this subatomic process of the sun which has been talked about freely (see Smyth report) is quite different from the D-D reaction and should not be confused with it. Dr. Bethe did publish in 1938 a study of the nuclear energy within the deuteron (*Physical Review*), which bears on the superbomb.

Scientific journals show that there is a continuing intense research upon the effects of deuterium bombarded with deuterium. For instance in the *Physical Review* for April 15, 1948, Dr. E. J. Konopinski of Indiana University and Dr. E. Teller of the University of Chicago go into the theory of angular distribution of the products of smacking deuterons into deuterons. Both are closely identified with U. S. atomic research.

The discoverer of the neutron, Dr. J. Chadwick of Britain's Cambridge University, headed a team studying deuterons in 1937, while groups at Massachusetts Institute of Technology, Rice Institute, State University of Iowa and elsewhere in the U. S. A. published reports in the years 1935 to 1940.

Many Uncertainties

Besides the prime question of whether the superbomb will act as expected, there are other uncertainties: Will the scientists cooperate in fashioning a new and more dangerous superweapon? Will enough money and facilities be devoted to the problem by the government? Will some other nation get the superbomb first?

There may be only a few scientists in the world capable of working out the theory and practice of the superbomb.

Even if more powerful bombs are not

PIPE BENDING MACHINE—Here is shown a 50-inch diameter pipe bend which is the largest one-piece bend ever made. The apparatus, developed at the Jersey City Works of The M. W. Kellogg Co., will mean longer life, reduced maintenance and superior performance for piping systems of process units.

needed, research should continue on nuclear energy from deuterium. Power plants of the future might be run on this atomic fuel. The production of a continuing (chain) reaction that won't explode should be as possible with heavy hydrogen as with uranium. And there is probably more heavy hydrogen than uranium on earth.

Science News Letter, July 17, 1948

NUCLEAR PHYSICS

Control of Atomic Bomb

If it is taken from the hands of civilians and given to the military it will create great uneasiness here and abroad. It will be an important political issue.

➤ A PRIME political question in this year of politics is:

Who shall control the atomic bomb, civilians or military?

The peace of the world may depend upon its answer.

The decision to put the bomb securely in the hands of the U. S. Atomic Energy Commission, composed of civilians, seemed to have been made by the passage of the McMahon Act two years ago.

But by providing only two-year terms for the atomic energy commissioners, Congress has served notice of the possibility of changes to come.

There is a quiet drive underway to put the military service back into the driver's seat on atomic energy. Latest manifestation is a plan sponsored by the McGraw-Hill Publishing Co. through its $15-per-year monthly magazine, *Nucleonics*. This divorces military activities and production from the AEC, and actually leaves only research in the hands of the AEC.

If atomic bombs were ordinary weapons it might not be very important just where the U. S. A. stock is kept and who controls it. But atomic bombs are extraordinary, devastating weapons. They are unlike machine guns, ordinary bombs or 16-inch guns. One can wipe out a city.

The rest of the world is afraid of America's atomic bombs. There is a measure of reassurance in the fact that the armed forces of the U. S. cannot use atomic bombs until they are turned over to them by the AEC on presidential order.

No angry general or admiral can order an atomic bomb dropped on his own authority, as he might order a border guard to fire upon attackers. The dropping of an atomic bomb would be the equivalent of a declaration of war and that is the job of Congress on the recommendation of the President.

There is still high fear on the part of many that, given the bombs and a more aggravated international situation, some high military officials may be tempted to start a preventive war. Some have openly urged this.

As it is now close cooperation of the military services with the Atomic Energy Commission provides for development and testing of atomic weapons, as was done at Eniwetok.

The loyalty investigations of AEC employees (as well as all government employees) with attention being paid to the most insubstantial gossip of "guilt by association" have done great damage to the quality of the scientists at work on the atomic energy program. The scientists themselves say that our second or third team is in the atomic energy game today.

Peaceful use of atomic energy has developed much more slowly than most scientists and laymen had hoped it would. Not even pilot plants for atomic power are underway, so far as known. This is added discouragement.

If the atomic bombs themselves are turned over to the men in uniform, it will be a new and ominous danger signal of a new war. This will be the case even if it should be done, secretly or openly, by Presidential order, without new legislation or change in atomic energy control.

Science News Letter, July 17, 1948

Losses of *vitamin C* value occur in plants that grow too much to foliage.

Question Box

ENGINEERING

How are combustible gases produced from unmined coal? p. 38

ENTOMOLOGY

What new chemicals are useful in killing grasshoppers? p. 46

GENERAL SCIENCE

How will science help in the 1948 Olympic Games? p. 37

MEDICINE

How does blood ward off diseases? p. 42

What new remedy has been found for typhoid fever? p. 34

What new tactics may help in fighting polio? p. 34

NUCLEAR PHYSICS

What element might be used in an atomic superbomb? p. 35

What would be the disadvantages of military control of the atomic bomb? p. 36

ORDNANCE

How does "Alloy X" prolong the firing life of guns? p. 44

Photographs: Cover, General Electric Co.; p. 35, The M. W. Kellogg Co.; p. 37, Westinghouse Electric Corp.; p. 39, Zator Co.; p. 42, p. 43, American National Red Cross.

SCIENCE NEWS LETTER

Vol. 54 JULY 17, 1948 No. 3

57,600 copies of this issue printed.

The Weekly Summary of Current Science, published every Saturday by SCIENCE SERVICE, Inc., 1719 N St., N. W., Washington 6, D. C., NOrth 2255. Edited by WATSON DAVIS.

Subscription rates: 1 yr., $5.50; 2 yrs., $10.00; 3 yrs., $14.50; single copy, 15 cents, more than six months old, 25 cents. No charge for foreign postage.

Change of address: Three weeks notice is required. When ordering a change, please state exactly how magazine is now addressed. Your new address should include postal zone number if you have one.

Printed in U. S. A. Entered as second class matter at the post office at Washington, D. C., under the act of March 3, 1879. Established in mimeographed form March 18, 1922. Title registered as trademark, U. S. and Canadian Patent Offices. Indexed in Readers' Guide to Periodical Literature, Abridged Guide, and the Engineering Index.

Member Audit Bureau of Circulation. Advertising Representatives: Howland and Howland, Inc., 393 7th Ave., N.Y.C., PEnnsylvania 6-5566 and 360 N. Michigan Ave., Chicago, STAte 4439.

GENERAL SCIENCE

Science Enters Olympics

Remote-control gun, sand leveler and an improved photo-finish camera are among the new scientific instruments which will insure a higher degree of accuracy.

➤ WHEN the athletes of 59 nations line up at Wembley Stadium in London on July 29 for the opening shot of the fourteenth Olympiad, science will be at the trigger of the starter's gun.

This year's Olympic track and field events will be the most scientifically conducted athletic meet ever held. Right down to the construction of the pole vault standards and the leveling of the sand in the broad jump pit scientific ideas have been brought into play to insure the highest degree of accuracy in timing and measurement.

The starting guns will be operated by remote control. In the usual start with a gun in the hand of the starting official, the man on the inside of the 400 meter race, for example, would have heard the shot more than one-tenth of a second before the man on the outside lane. Because this race starts on the curve of the track and is run in lanes, the outside and inside runners are nearly 150 feet apart. The use of remote control firing will make it possible to site the gun equidistant from all runners, while the starter will be free to take up his normal position where he will most easily be able to see all the competitors.

Even the photo-finish movie cameras of the 1932 and 1936 Olympiads are now obsolete and have been superseded by more modern equipment. The improved camera to be used at Wembley will, by an ingenious movement of the film, produce within 90 seconds of the finish of the race a print showing the exact order of the runners as they pass the post. It also will give the exact time between runners.

The judges will have an almost instantaneous photographic record which they can examine right in their stand. In the event of a disputed finish they won't have to go trotting off to a projection room to see a film run off, as was necessary with the old cameras.

In the pole vault, newly designed standards of aluminum will be fitted with pulley and hoist to haul the cross bar back into place. No longer will judges have to perform tricky and precarious feats of balance to replace the bar. The bar, too, is of aluminum and is claimed to be completely non-sag. The standards are fixed with a pointer and a sliding scale registering in meters and feet. They are placed so that officials can read all heights while standing on the ground.

Bumpy sandpits, that old bogey of the broad jump and the hop, step and jump, have been scientifically eliminated. This year the rough judgment of the eye will no longer be relied upon to check that the entire surface of the sand in the pit is in the exact same horizontal plane as the top of the take-off board. A mechanical leveler, consisting of a metal scraper which slides on rails, will dish up a surface on which not one grain of sand will be out of place.

Scientific precision will also be observed in the measurement of jumps. The sand used will be moulding sand as used in iron and steel foundries. This will take a firm, clean-cut impression of the jumper's heel. Then a hinged frame, sliding on a metal runway fixed on a concrete base at the side of the jumping pit, will carry a hair-line which can be lowered exactly over the back edge of the heel imprint. As a final precaution, a special no-jump indicator will show if the jumper steps over the take-off board —like the "TILT" indicator on a pinball machine.

In the throwing events, too, the judges' task has been considerably lightened and the degree of accuracy of measurement greatly increased by a bit of scientific application. Measurements for the hammer, shot and discus will no longer have to be carried back to the throwing circle. Accurately placed pegs will describe a series of parallel arcs at suitable distances from the circle. Over the pegs will fit a special arc-shaped framework and it will be from this framework arc that the distance is measured. In this way only a very short distance will have to be measured, making for greater accuracy. A special device will insure that the steel tape measure is at right angles to a tangent drawn on the datum line arc so that the shortest distance between arc and throw mark is measured.

Here are some of the other applications of science to the Olympic games:

An electric timing device will be used in the rowing events.

A new type of starting block will be individually adjustable to the taste of each runner.

Standards and bar of the high jump will be of weatherproof, non-warp, non-sag aluminum.

Hurdles have been redesigned of tubular aluminum. They will fold flat for storage and, in use, will be adjustable to 2 feet 6 inches, 3 feet, and 3 feet 6 inches, as may be called for by the event. They will be accurately weighted to meet the prescribed eight pounds "toppling force" requirement at each height.

The Olympic Committee of the XIVth Olympiad is using science to make the Olympics a more accurate meet.

Science News Letter, July 17, 1948

STRESSES AND STRAINS—These are revealed by use of plastic counterparts in operating machinery which can be examined under polarized light.

ENGINEERING

Plastic Affords Inside View of Deformities

➤ INSIDE views of stresses and strains in operating machinery are made possible by the temporary use of plastic counterparts long enough to make interior records for later study.

The deformities are examined at leisure by use of polarized light, and they appear as a series of colored lines. Not any plastic may be used. The satisfactory kind is a new type developed by Westinghouse research engineers. It can be molded and cut into exact models of tools and machine parts, and it can be cast into chunks from ten to 20 times larger than any resin available formerly for such strength tests.

Stresses in a rotary shaft, nuts and bolts, crane hooks and other parts can be studied. To determine where a crane hook should be strongest, an exact model of the hook is made in the plastic. This is heated to about the boiling point of water, and any block of the desired weight is hung on it. The hook, with the weight on it, is then allowed to cool to room temperature.

By this process the distortions due to the load are "frozen" in the translucent plastic hook.

Science News Letter, July 17, 1948

Meteors, often called falling or shooting stars, are pieces of stone or iron that enter the atmosphere and burn, heated by the friction of the air; they travel some 60 miles a second, the glow becoming visible about 60 miles above the earth.

PHYSICS

Advance Theory of Matter

➤ MATHEMATICAL gymnastics of a 30-year-old Harvard physicist, who drew murmurs of appreciation and awe from an audience of leading scientists, may help explain the nature and structure of matter.

Dr. Julian Schwinger of Harvard performed the mathematical feats at a session of the American Physical Society meeting at the California Institute of Technology. He said that his new method helps weed out deviations in present theory. Still unsolved, he emphasized, is the comprehensive answer to many problems of physics which will require a unified "field" theory explaining both waves and particles.

Twin horns of the modern dilemma in physics are two theories upon which scientists have for many years based their concepts of electrons and electromagnetic waves. One theory, named after the modern English physicist, Dr. P. A. M. Dirac, satisfactorily explained the behavior of electrons as charged particles, or fixed points. The other theory by the nineteenth century British physicist, Clerk Maxwell, explained the behavior of electromagnetic waves of all kinds, including such waves as light and radio. The theories are valid singly, and satisfactorily account for two separate physical phenomena. Scientists used one set of rules to explain the behavior of electrons as particles, and another to explain waves.

When the electron as a charged particle is placed in an electromagnetic field, however, the Dirac theory of the electron as a fixed point breaks down. Until very recently, this inadequacy remained a bridge with no necessity of being crossed. Recent experiments by Dr. I. I. Rabi of Columbia University, under whom Dr. Schwinger once studied, and others, however, blew the bridge sky high. Employing new and improved methods of studying electron dynamics, Dr. Rabi, a Nobel prize winner, showed the deficiencies in the theory so that they could no longer be ignored.

With extremely precise measurements he specifically pinpointed the deviations in Dirac's theory and pointed up the whole problem.

With an appreciable body of scientific knowledge hanging in the balance, Dr. Schwinger came to the rescue with a mathematical method of accounting for the deviations. By slightly modifying the Dirac theory, he salvaged a workable portion of the original idea and effected a compromise if not a wedding between Rabi's new findings and the old theory.

Science News Letter, July 17, 1948

ENGINEERING

Unmined Coal Yields Gas

➤ A SECOND experiment is underway in Gorgas, Ala., following that of last summer, to produce combustible gases by burning unmined coal deep underground as it lies in its natural seams. A contract to carry out the work has been made by the U. S. Bureau of Mines and the Alabama Power Company, the team that carried out the first experiment a year ago.

Basically, the plan followed consists of drilling from the surface down through the layer of coal. Fire is started by dropping an incendiary bomb down a hole. Air, under considerable pressure, is forced down the same hole to feed the fire and to force the combustible gases formed by the burning through the coal layer to one or more of the other drillings. The gases arising to the surface are captured and piped to storage tanks. They can be used to fire a boiler or used to make synthetic liquid fuels.

The experiment last summer showed that gases produced by burning unmined coal offer a potential source of fuel for power and raw materials for synthetic liquid fuels. If the plan proves commercially feasible, much coal can be utilized that is in layers too thin for economical mining. The gas obtained is a cheap source of carbon monoxide and hydrogen, the number one problem in making the manufacture of synthetic liquid fuels economical.

Last year's experiment showed that the underground combustion can be maintained and controlled, that coal in place can be gasified completely, and that the roof rock settles behind the burning face without cutting off the air or gas. But the gas obtained was of lower heating value than desired, probably because of leakages of gas and air pressure through cracks and breaks in the 30-foot layer of earth over the burning coal.

This year a 40-inch seam approximately 100 feet below the surface is to be used. Higher air pressure and higher temperature will be employed. Oxygen and steam can improve the gas quality further, as was proven last year.

Science News Letter, July 17, 1948

ENGINEERING

Flood Control in Mines Studied by Government

➤ FLOOD-CONTROL measures, an underground type little known but important in mining, are again to be studied this year in the anthracite coal region by the U. S. Bureau of Mines. A federal appropriation of nearly $300,000 is now available.

Mine-water problems of the hard coal fields are of long standing but are growing worse. The average anthracite mine now pumps out about 13 tons of water for every ton of coal removed. Twenty-five years ago the ratio of water pumped to anthracite extracted was eight to one. The bureau has conducted scientific and technologic investigations to assist operators in solving this water problem since 1944.

Billions of tons of anthracite are inundated by underground water pools in the anthracite region. These pools must be emptied before mines can be worked. Even those in worked-out mines are a hazard to neighboring excavations. The so-called barrier pillars left unmined along property lines or lines of adjacent mining operations may be a hazard. They operate normally as dams to prevent water in one mine from suddenly breaking into another, with subsequent loss of life or property. Proper pillars are a part of the study of the Bureau.

Present investigations are concerned with means for reducing the infiltration of surface and other water into the mines as well as with barrier pillars, pumping methods and the proper disposal of the pumped water so that it will not seep back into the same or into other mines. One of the factors retarding flood-control projects embracing the entire anthracite region is an estimated $100,000,000 cost.

Eleven counties in eastern and northeastern Pennsylvania produce 95% of the anthracite in the United States. Approximately 80% of the production is consumed in the New England States, New York, New Jersey, Maryland and the District of Columbia. Some 40,000,000 persons are now dependent on hard coal for residential heating. About 1,250,000 persons depend, directly or indirectly, upon the anthracite industry for a living.

Science News Letter, July 17, 1948

ENGINEERING

Steam Blast Melts TNT Out of Its Steel Shell

➤ STATESMEN may be a bit slow about beating swords into plowshares, but a civilian employee of the Army, Cedric A. Hoskin of Succasunna, N. J., has devised an improved method for getting TNT, PETN or other high explosive charges out of shells, for possible use as blasting powder.

It consists simply of a grid of steam pipes, each one with a row of discharge-vents over which the opened shells are set. The steam blast melts out the high explosive, which trickles into a sloping-bottomed tank below, kept full of cold water. The trickling, tar-like explosive forms into firm pellets, which are raked out through an opening at the lowest part of the bottom, dried, and prepared for other uses. The empty shells, of course, are high-grade steel scrap.

Rights in the patent, No. 2,444,045, have been assigned royalty-free to the government.

Science News Letter, July 17, 1948

CHEMISTRY-TECHNOLOGY

Code Chemicals for Index

By this method more than a dozen bits of information are put on a simple notched card. Promises to speed research by allowing exploration of related compounds.

➤ A NEW and simple tool for recording and finding information about simple or complex chemicals and their properties has been developed by Calvin N. Mooers of the Zator Co., Boston, Mass.

Already in use by one large pharmaceutical research laboratory for keeping track of its organic chemistry experimental work, the new application of the Zator method of indexing information promises to speed research by allowing exploration of related compounds that might be overlooked by the usual laborious complicated filing.

The use of complicated chemical names in indexing is abandoned. Simple codes are used for the essential parts of the structural formulae of the chemicals. The new method actually puts more than a dozen pieces of information on a simple notched card. Mechanically sorted according to the random pattern notches, it is easy to pick out any desired combinations of chemical or other properties.

When more widely used, this Chemical Zatocoding, as it is called, promises to bring to attention compounds for medical or other use that would otherwise be overlooked. It will now be possible to search for unexpected combinations of chemical structure and properties that research shows are desirable.

Untangling complex patent claims is another application of the new method.

Each factor in the chemical structure is described on the card in a complete and direct fashion. The number of rings is noted. The size of the molecule is specified. The structure is described point by point. The elements are listed according to their place in the compound. If the structural formula is incomplete, the portion so far known is coded. The system for doing this and translating the information into code notches to allow selection is so simple that it can be learned in a half hour. Information other than chemical structure, such as color, physical properties, biological action, patent data or uses can be put on the same card.

"When used in chemical-biological screening," Mr. Mooers explained, "the new finding method should result in accelerating the discovery of useful properties of chemicals. Such screening has in the past resulted in new anti-malarial drugs, ANTU, the rat-killing chemical, and BAL, the antidote for mercury poisoning."

Correlation between the spectrum lines of a compound and its chemical structure should also be facilitated by the Zator method.

A sorter of uncomplicated design is used to select the combinations of information desired. Out of a thousand cards, for instance, it was possible in one use in five minutes to select the ten compounds containing an amine attached to some aliphatic group.

Science News Letter, July 17, 1948

PHYSIOLOGY

Threshold for Sweating Determined by Tests

➤ WHEN the temperature gets up to 93.9 degrees Fahrenheit, with relative humidity at 50%, a normal person will start sweating even when resting quietly in bed.

This threshold level for sweating, all too familiar these hot days and nights, was determined in scientific measurements reported by Dr. G. E. Burch, of Tulane University School of Medicine and Charity Hospital in New Orleans, in the *Proceedings of the Society for Experimental Biology and Medicine* (April).

With exercise and increased heat production sweating starts at a lower temperature.

With a low relative humidity, the air temperature had to be higher before sweating started in the 11 men, women and teen-age children studied. With relative humidity at 40%, sweating started at 96.8 degrees Fahrenheit. With a relative humidity as low as nine per cent, sweating started at 102.2 degrees Fahrenheit.

In one patient sweating went in cycles. It alternately occurred and stopped at 15-minute intervals, even though conditions in the room remained the same. Apparently sweating cooled the man enough to abolish the need for this natural cooling mechanism for a certain length of time.

"He accumulated heat, sweated again, cooled his body, and then stopped sweating," Dr. Burch explains.

This cyclic sweating conserves water and electrolytes, such as salt, that are lost from the body in sweat.

The studies were made in an air-conditioned room. The rate of water lost from the forearm and the skin over the stomach was measured.

When the studies were prolonged, the people became restless and irritable and "nervous" or "psychogenic" sweating resulted. This made it impossible to observe the sweating due to the temperature.

Science News Letter, July 17, 1948

CHEMICAL ZATOCODING—Simple codes are used for complicated chemical names for indexing purposes which, by means of mechanical sorting according to the random pattern notches, afford an easy method of picking out any desired combinations of chemical or other properties.

MEDICINE

New Antibiotic May Aid Fight on Athlete's Foot

➤ DISCOVERY of a new antibiotic drug, like penicillin and streptomycin, which might prove a remedy for fungus infections from athlete's foot to more serious diseases involving lungs, brain and nervous system, is reported in the *Proceedings of the Society for Experimental Biology and Medicine* (April).

The new drug, called Bacillomycin, was discovered at the Wyeth Institute of Applied Biochemistry in Philadelphia by Drs. M. Landy, now at the Army Medical Department Research and Graduate School, and G. H. Warren, S. B. Rosenman and L. G. Colio.

Bacillomycin comes from a strain of the organism, Bacillus subtilis, which has already yielded such antibiotic drugs as subtilin, bacitracin, bacillin and eumycin.

Unlike penicillin and most other antibiotic drugs, Bacillomycin has striking power against fungi and almost complete lack of action against bacteria.

Practically all the important fungi that affect the skin, technically called dermatophytes, and those that cause systemic, or internal, disease are sensitive to Bacillomycin's action in the test tube experiments reported.

Science News Letter, July 17, 1948

CHEMISTRY

Low-Cost Barium Chloride Made by New Process

➤ A LOW-COST method of making barium chloride, an important chemical reagent widely used in industries, was revealed by the University Department of Chemical Technology in Bombay, India. The process uses as raw materials the mineral barytes, which is barium sulfate, and magnesium chloride, perhaps the cheapest source of chlorine.

The method involves the roasting of barytes with wood charcoal, powdering the resulting mass, and heating the pulverized material with a 46% to 47% magnesium chloride solution at less than the boiling point of water. The low-cost barium chloride obtained is particularly suitable for the removal of sulfate impurities in brine, and many other possible commercial applications are being investigated.

Science News Letter, July 17, 1948

ENGINEERING

Hydraulic Jack System New Invention for Cars

➤ GONE are the days of the old-fashioned automobile jack, that you have to dig out of the junk in the bottom of the luggage space, and fuss around until you think it's under the axle, and then operate by elbow. grease—only to have the darned thing slip out and let the wounded wheel down again with a "whoomsh." A new invention by Frank Sragal of Detroit promises to make it as obsolete as the hand crank on the nose of the Model T.

The basic idea is very simple. There are four hydraulic jacks permanently attached to the frame of the car, each near a wheel. All are connected to a master cylinder, which is operated by the conventional brake pedal. There is a selector mechanism, which the operator turns to open the inlet valve to the jack which he wishes to function. Then he pumps away with his foot until the wheel is lifted free of the road.

When the spare has been put on, the operator shifts the indicator from inlet to outlet. Then a coil spring that is wrapped around the jack rod pulls it back up into its normal retracted position. To make sure that none of the jacks is inadvertently pushed down to the road while driving (which would of course mess things up pretty badly) the apparatus is locked in inoperative position, and can be released only with the ignition key.

Mr. Sragal has received U. S. patent 2,444,272 on his invention.

Science News Letter, July 17, 1948

ZOOLOGY

Whales Are in Danger Of Becoming Extinct

➤ WHALES are in danger of traveling the unreturning road to extinction, in spite of the respite which the war gave them from the harpoon guns of whalers, declares J. E. Hamilton, veteran student of the ways of the great sea-beasts, in the British journal *Nature* (June 12). Mr. Hamilton, after years of research on the Antarctic whaling grounds, now lives at Stanley, on the Falkland Islands, which may be regarded as in the nearer suburbs of the whales' domain.

Whale catches since the war have contained fewer pregnant females than formerly, he states, and individual measurements of the two principal species are shorter than they used to be. Moreover, giant individual whales are no longer being caught. All three of these phenomena are marks of a dwindling population, he points out.

Mr. Hamilton is strongly of the opinion that the lower size limit for permitted catches is too small. It should be revised upward, especially for females, if the animals are to be given a chance to reproduce. Also, the practice of reckoning the catch in "blue whale units," with one blue whale counted as the equivalent of two fin whales, two and one-half humpback whales or six sei whales, conceals dangerously large kills of the smaller-sized whales.

He warns that today's whaling industry, in its eagerness for the greatest possible profits, may be dooming itself to extinction along with the great animals that are its foundation.

Science News Letter, July 17, 1948

IN SCIENCE

METALLURGY

Sample Molten Steel by "Eye-Dropper" Technique

See Front Cover

➤ SAMPLES of molten steel at 2,700 degrees Fahrenheit are taken from the pot at the General Electric laboratory by what might be dubbed eye-dropper technique. The sampling tube is a heat-resistant glass with a rubber squeeze-bulb on the end.

In the sampling process, the glass tube, which is about the size of a lead pencil and 18 inches long, is stuck into a ladle of the molten steel with the rubber bulb compressed. When the bulb is released, as shown on the cover of this week's SCIENCE NEWS LETTER, the liquid metal runs up into the tube just as water or a medicine is drawn up into the familiar eye-dropper. When the metal has hardened, the glass tube is cracked off.

In testing the steel, the sample rod from the glass tube is sawed in two pieces and the pieces used as electrodes of a high-voltage electric arc. The light from the steel electrodes varies with the make-up of the metal. By the use of prisms, trained observers are able to judge the quality of any batch of steel sampled with the eye-dropper.

Science News Letter, July 17, 1948

ASTRONOMY

Ancient Explosion Just Revealed to Astronomers

➤ AN EXPLOSION that occurred 4,000,000 years ago has just been discovered. At that time a terrific atomic outburst caused a distant star in the constellation of Cygnus, the swan, to blaze forth in a burst of glory.

The new supernova is of the fifteenth magnitude, 4,000 times fainter than the faintest star visible with the naked eye. If as close to us as our sun, it would shine with the brightness of 2,000,000 suns. But this star is so distant it takes 4,000,000 years for its light to reach us. That is why we are just learning of the explosion.

The object was found on a photograph taken by Dr. N. U. Mayall of the University of California's Lick Observatory, Mt. Hamilton, Calif. The supernova apparently reached maximum brightness several weeks ago, and is expected slowly to become fainter during the next few months. Located in a spiral nebula known as NGC 6946, it is near the border of Cygnus toward the constellation of Cepheus.

Science News Letter, July 17, 1948

NCE FIELDS

GEOGRAPHY

Cameras and Airplanes Are Photomapping Alaska

➤ A SUMMER-LONG aerial survey of 30,000 square miles of Alaska is now underway, the U. S. Navy revealed. Navy planes and Navy cameras are doing the job. It is being carried out in cooperation with the Department of the Interior and other government agencies.

Six Navy P2V Neptunes are being used. Necessary modifications to fit them for this particular task were made at the Lockheed plant in California. The planes are based on the former Army airfield on Annette Island, near Ketchikan. The photographs are being taken from a height of approximately 20,000 feet.

Data secured from the photographs will be used to determine the waterpower possibilities of the panhandle region of Alaska, which stretches from Skagway to the south. They also will help estimate paper-pulp resources of the area. The survey will be of value to civil transportation by air because Alaska is on the Great Circle route from continental United States to points in Asia by way of the Aleutian islands. Alaska is also a valuable take-off point for planes to Europe by the North Polar route.

Science News Letter, July 17, 1948

PHYSIOLOGY

Jet Engine Noises Found Harmless to Shopmen

➤ WORKERS in jet-engine factories are unharmed by the high-pitched noises made by ordinary low-performance turbo-jets in tests carried out by U. S. Navy scientists. Final conclusions are not yet reached on the effects of very high frequency jet engine noises on the human body, but they may be harmful because ultra-high sound waves have already been proved harmful to mice and other animals.

The Navy conclusion is based on a 26-day test with 10 volunteers, including nine enlisted men and one medical officer, conducted at the Navy's Aero Medical Laboratory, Philadelphia. The engine used was a General Electric I-16 turbo-jet located in an open-end test cell.

The men were protected from audible noises by helmets, headphones, ear doughnuts or cotton ear plugs. They spent their time during the test periods in reading, drowsing or loafing.

The first report of the test appears in *All Hands* (July 11), a Navy publication. It states the study was undertaken because of ill-founded fears and rumors about the harmful effects of turbo-jet engine noises to workmen in their vicinity. Jet engines are known to produce, at certain speeds, sound waves too high-pitched for the human ear to hear. They are somewhere between 20,000 and 500,000 double vibrations a second, the publication states. The upper limit of audible sounds for the human ear is about 20,000 double vibrations per second.

The general physical condition of the men did not change during the test, the Navy states. Neurological tests showed the nervous systems unchanged, and measurements of pulse, respiratory rate, temperature and blood pressure did not indicate the sound had caused any ill effects.

Five of the men undergoing the experiment lost weight, varying from about five to 19 pounds. All five felt abnormally tired or irritable. Of the other five, one felt abnormally nervous, and one more tired and irritable. The other three noted no physical or emotional change.

The general conclusion of the Navy scientists who conducted the tests is that, although ultra-high frequency does damage to some animal tissue, ill effects on human tissues appear unlikely unless the frequency is extremely high.

Science News Letter, July 17, 1948

GENERAL SCIENCE

M.I.T. Receives Estate for Teaching and Research

➤ ROUND HILL, the large estate of the late Colonel E. H. R. Green at Dartmouth, Mass., has been presented to the Massachusetts Institute of Technology by Mrs. Matthew Astor Wilks of New York, the present owner of the estate.

"While it is too early to make any specific plans, the estate offers exceptional possibilities as a center for technical education in various fields as well as for research," Dr. Karl T. Compton, president of the Institute, said.

The estate, with its stone mansion and numerous other buildings, occupies a plot of 277 acres on Buzzard's Bay, eight miles south of New Bedford. It includes a large farm with a farmhouse, barns and other buildings, several residences, and a radio station. At one time the estate had its own private airfield.

In 1925, when Colonel Green was living at Round Hill, he placed the estate at the disposal of the Massachusetts Institute of Technology for various research projects, and for the ensuing ten years the Institute's staff made important advances in radio communication, the navigation of aircraft, high voltage research, and meteorology.

From 1925 until his death in the spring of 1936, Colonel Green not only made his estate available to the Institute for research, but in addition gave it substantial financial support which resulted in notable contributions to the nation's welfare and to science in general.

Science News Letter, July 17, 1948

CHEMISTRY

Hard Water Softened by One of Polyphosphates

➤ HARD WATER is softened by dissolving glassy sodium phosphate in it. This keeps the calcium and magnesium in the water from combining with soap, the American Chemical Society was told at its meeting in Syracuse, N. Y., by Dr. Everett P. Partridge, Hall Laboratories, Pittsburgh.

This chemical is one of the group known as polyphosphates which are produced in large quantities and widely used in many industrial processes, including tanning sole leather and dveing textiles.

Polyphosphates are used also in controlling the properties of mud used in drilling oil wells, improving the coating of paper for use in picture magazines, and conditioning water so that it will not form scale in boilers. The paste of titanium oxide and water used in paints will flow like milk if a small amount of this sodium phosphate is added.

Chemists are unable to explain the action of the glassy sodium phosphate in softening water, he stated. Some ordinary water softeners work by converting the soluble calcium and magnesium salts in the water into insoluble particles which settle on the bottom of the container. With the glassy sodium phosphate the water remains clear and there are no settlings. This softening without precipitation chemists call sequestration.

Science News Letter, July 17, 1948

ARCHAEOLOGY

Find Carving in Mexico Believed 20,000 Years Old

➤ WERE there native American artists in Mexico 20,000 years ago, at the same time that Cro-Magnon masters were frescoing the walls of caves in France and Spain, and carving images of ivory and reindeer horn?

First bit of evidence that such may have been the case was laid before the Archaeological Society of New Mexico by Dr. Hellmut de Terra of the Viking Fund, in the shape of a miniature sculpture which he found at Totolizingo in the Valley of Mexico. The find was made in the sand of what had once been a lake beach in the last centuries of the Pleistocene ice age. The geologic date is set by fossils of extinct species of horse, elephant and deer dug up at the same level. Further evidence of human occupation of this beach was indicated by three small bone points found by Dr. de Terra.

This small carving, the discoverer pointed out, apparently indicates the existence of a prehistoric race on this continent with an age at least double the 10,000 years estimated for Tepexpan Man, who since his discovery in February, 1947, has been considered America's oldest inhabitant.

Science News Letter, July 17, 1948

MEDICINE

Blood Wards Off Disease

Blood's gamma globulin protects children from diseases such as jaundice, mumps, measles and other serious infections that strike the young.

By JANE STAFFORD

MEASLES, mumps, scarlet fever, jaundice. When you were a youngster you probably had all of those ailments, with whooping cough, chickenpox and German measles thrown in for good measure. Chances are you were pretty sick with most of them, too. Many of those diseases kept you in bed for days and days. You felt burning up with fever, your back and legs ached, your throat was sore. Then, when you began to feel a little better, the pain of an earache woke you in the middle of the night and wouldn't let you sleep again.

Today's youngsters are luckier. They can escape whooping cough entirely, by protective "shots" given them when they are babies. If jaundice breaks out at school or camp, all but the first young victims can be given shots to protect against that, too. And if they do get some of the diseases you had as a child, they will not be so sick.

Big Measles Year

Take measles, for example. This has been a big measles year. More than 500,000 cases have been reported since the season started. But many of these children got off lightly. They were sick a day or two, instead of a week or more. They had only a slight rash, very little fever. Not one in 100,000 died. More important, they escaped the serious complications that used often to follow measles in the past, such as pneumonia, ear infections that sometimes led to permanent deafness, kidney and heart damage that crippled the victim for life.

What made the difference? Some of it was due to sulfa drugs and penicillin that could be used to stop quickly the complicating infections that made measles so dangerous. A big part of the difference was due to a new kind of protective "shot" doctors now give to children four or five days after exposure to a case of measles at school or at home.

The anti-measles "shot" is a substance called a gamma globulin. It came from blood, the good red blood you gave to the Red Cross during the war to help save our wounded men overseas. American civilians were generous with their blood during the war. They gave over 13,000,000 pints of it. The wounded got all they needed. And there was even some left over after the war. The surplus was in the form of plasma, the fluid part of the blood from which the solids had been removed.

This plasma part of the blood contains, among other valuable substances, the antibodies formed in the body to fight off invading disease germs. Since at least 85 out of every 100 Americans have had measles by the age of 20 the blood collected during the war had plenty of measles-fighting antibodies in it. Measles antibodies not only help fight off the measles germs during an attack, they also make the body immune to further attack by measles. That is why you do not get more than one attack of measles.

During the early part of the war, in fact by 1942, Dr. Edwin J. Cohn and associates at Harvard Medical School had found a way of getting the globulin that contained the measles antibodies out of blood plasma in a concentrated form.

It was a by-product of the process by which serum albumin was separated from the plasma. This serum albumin was used, as soon as it was available, instead of plasma for transfusion to wounded and shocked men. It was just as effective as plasma and saved much space in shipping. At first the gamma globulin for fighting off measles was also reserved for the armed forces. The Army and Navy, recalling World War I experience, had expected measles epidemics in the training camps among young recruits from rural areas. If any such had developed, gamma globulin could have been used to check the epidemics and protect other young recruits who had not had measles.

Gamma Globulin

By 1944, however, there was enough gamma globulin on hand for the Red Cross to start distributing it through health departments to doctors, clinics and hospitals. It went back, free of charge, to the people who had given the raw material, blood, from which it was made.

SPEEDING RECOVERY—After a serious operation, blood from a Red Cross center is helping this child pull through.

PROTECTIVE SHOTS FROM BLOOD—Immune serum globulin is injected into a youngster in the children's ward of a hospital where an epidemic of measles threatens. In most cases, this will induce only a light attack and help give immunity.

Since 1944, more than 700,000 doses have been furnished by the Red Cross to help fight this childhood plague.

Most children are given what doctors call a "modifying" dose. The object is to let the healthy youngsters get a light attack of measles, but not escape it altogether. In this way they get a chance to build up in their own blood the antibodies that will protect them against measles throughout the rest of their lives. The antibodies in the gamma globulin from another person's blood protect only for about three weeks, instead of for life.

Anti-Measles Dose

Sick children and sick grown-ups who have never had measles, however, get a bigger dose of gamma globulin if they are exposed to measles. They get one big enough to ward off an attack completely.

But measles was probably not the only "catching" disease you had as a child. Like most other grown-ups, you probably had quite a few of the others. And, as in the case of measles, your body built up antibodies to the germs of these other diseases, too. The antibodies are found in the same gamma globulin part of the blood plasma. So it may be possible to protect children against other diseases besides measles by doses of gamma globulin.

Jaundice from the disease doctors call infectious hepatitis is one example. This proved to be a serious problem during the war. Actually, scientists have since found that they were dealing with two kinds of liver inflammation, or hepatitis, both causing the yellowed skin condition known as jaundice. One kind comes in epidemics, and apparently is spread through contaminated water. Against this kind, gamma globulin gives protection. When the disease broke out in one institution for children, only two out of 100 got jaundice after they had been given gamma globulin, whereas 23 out of 100 got jaundice in the group not given the globulin. Unfortunately, gamma globulin does not protect against the other kind of hepatitis and jaundice.

Antibodies to infantile paralysis, to the streptococcus that causes scarlet fever and other serious diseases, and to mumps are also found in gamma globulin of blood.

Blood's gamma globulin may even in the future be able to save babies from coming into the world blinded from cataracts, deaf, with damaged hearts and feeble minds. Many such congenital defects, doctors now know, are due to the baby's mother having been attacked by German measles during the early months of pregnancy. Some medical authorities have suggested that abortions be performed on expectant mothers, if they get German measles, to prevent the birth of defective children. But other scientists are hoping they can use a gamma globulin to ward off the disease in the mother, and thus prevent damage to her unborn child.

For this and other possible healing uses of blood, much more research is needed. And to do the research, scientists must have a supply of blood. At present, there is only enough gamma globulin on hand to take care of measles for another year.

We have the blood. It is circulating in the bodies of living, healthy American men and women. We gave over 13,000,000 pints of it during the war. Now we are asked to give some of our blood in the peacetime fight against disease and accidental death. Many are already giving to local blood banks. But these banks alone cannot supply the 3,000,000 to 4,000,000 pints medical authorities estimate are needed each year.

Nation-Wide Need

The blood need is nation-wide. The job of getting it must be done on a nation-wide basis, medical and health authorities decided. So they asked the Red Cross to take over. That agency has now set up a National Blood Program. Regional blood centers are being set up as rapidly as possible all over the country. Bloodmobiles will operate out of these centers, going into the small towns and country villages to collect blood, and

Do You Know?

Tobacco requires more care in harvesting than almost any other field crop.

Wheat straw, millions of tons of which are wasted each year, is now increasingly used for blending with wood pulp to make paper and also to make building-board.

During the summer of 1947 nearly 50 different kinds of *prehistoric animals* were discovered in scientific diggings in New Mexico; they range from an extinct species of snails to the ancestral diminutive four-toed horse called Eohippus.

A new *wire* for wiring buildings is about two-thirds the size of the ordinary kind used but is coated with natural rubber over which is a synthetic rubber and then a hard shell of nylon; it resists gasoline, oil, fire, moisture, acids and light.

Five-sixths of *Maine*, over 16,000,000 acres, is wooded.

Aluminum can be used safely in the presence of sulfur because unattacked by it.

When two plants of different lines are crossed with one another, the resulting *hybrid* is often more vigorous than either parent.

ORDNANCE

"Alloy X" for Gun Bores

➤ "ALLOY X," a war-born metal for lining gun bores to prolong their firing life, has properties "so remarkable as to justify concealing even the basic metal from which it was evolved," it is disclosed in a new book, *Rockets, Guns and Targets* (Little, Brown and Company), edited by John Burchard of the Massachusetts Institute of Technology. The book as a whole is an account of the strides made in many fields of ordnance research by workers of the Office of Scientific Research and Development during the war.

Although the account does not state what Alloy X is, it seems safe to infer that it is not a new kind of steel, for it was one of the materials tested for barrel liners when it was found that no improvement in steel itself could prevent rapid erosion and hence loss of accuracy and velocity under the high powder-pressures used in modern military firearms and the even higher ones anticipated for the future. Steel gun linings are weakened and destroyed in three ways during firing: through the melting of a surface film by the intense heat of the burning powder, through its chemical action under the heat and high pressure, and through the friction of the projectile as it passes through the bore. Erosion results are serious: the exceedingly costly 16-inch naval gun becomes useless after about 200 rounds and has to be relined; near the other end of the size scale, the .50-caliber machine-gun barrel sometimes loses so much in accuracy after a few minutes of aerial combat that the plane is as good as unarmed.

Two methods of protecting gun-barrel steel are disclosed in the new book. One is the insertion of erosion-resistant liners, either for the full length of the barrel or at least near the powder-chamber, where erosion is worst. Stellite, a cobalt-chromium-tungsten alloy, has proved especially valuable for this purpose. The other method is a chromium plating on the whole surface of the bore. This plating is sometimes made a little thicker towards the muzzle. This imparted a slight choke, thereby giving the bullet some extra foot-seconds of muzzle velocity.

Other topics discussed at length in the book are the development of the many types of rockets used in the war, the recoilless 4.2-inch chemical mortar that was really a low-angle cannon, and the frangible bullet that made combat target practice more realistic yet perfectly safe.

Resistance to innovations by civilian "interlopers," and toe-dragging tactics by some of the "heavy brass" of the old-line Services comes in for some salty discussion in a chapter headed "Sand in the Gears."

Science News Letter, July 17, 1948

returning it after processing to the doctors and hospitals of the region.

At the regional centers, the blood will be typed, tested and treated with preservative. After 21 days, when it can no longer be used as whole blood for transfusions, it will be separated into plasma and red cells. Some of these materials will be kept in the centers for distribution as needed. Some will be sent to pharmaceutical houses for processing into serum albumin, gamma globulin, for measles, thrombin and fibrin foam for surgeons to use in stopping bleeding, and anti-hemophilic globulin. Some will be sent to medical research centers, for investigation of possible further healing uses.

All the blood and all the products made from it will be supplied free to hospitals and physicians for the people who need it.

The Red Cross will pay the expenses of collecting, processing and distributing. The cost to patient or family will be for the physician's or hospital's services in making the transfusion or the injection of gamma globulin or administering one of the other products.

Science News Letter, July 17, 1948

ENTOMOLOGY

Fight Snail with Beetles

➤ A BIG BLACK BEETLE with long legs and an insatiable carnivorous appetite may possibly become man's next ally in his unending fight against the pests that devour his crops and garden plants. Dr. F. H. Williams of the Pacific Science Board of the National Research Council transported a small collection of the insects from Africa to Hawaii where they will be put through critical tests in a triply screened laboratory, to see if they are adapted to Pacific island life.

If they pass the tests, and are approved for introduction by the administrative authorities, they will be sent on to Guam, Saipan and other islands in the Trust Territory under American Administration, and more will be brought from Africa to join them. The job for which they are being considered is attack on the six-inch-long giant African snail, which is chewing to shreds the cultivated plants and much of the wild vegetation of the islands.

This huge snail, *Achatina fulica* by name, was introduced into the islands during the period of Japanese occupation, as a food animal. Because the Japs liked it, the big mollusk was kept down to reasonable numbers. But the Japs are gone now, and neither the natives nor the Americans care to eat it. With nothing to hold it in check, the snail is flourishing—at the expense of anything green that gets in its path.

To find something that would be willing to eat it, Dr. Williams went to its native home in Kenya, East Africa. There he found this black beetle, whose name is Tefflus, attacking the much bigger snail as a leopard might attack a cow. Since Tefflus is one of the most promising predators thus far found, a test lot was collected and prepared for the long journey to the Central Pacific via the United States.

Dr. Williams also carried with him a couple of hundred scolid wasps, which have already passed their entrance exams as attackers against a beetle enemy of the coconut trees on the Palau islands. They destroy the undesirable beetles by laying their eggs on their larvae or grubs after stinging them into paralysis; the wasp larvae kill the infant beetles by feeding on their tissues.

Funds for Dr. Williams' work were supplied by the Office of Naval Research, and the entire project has been carried out at the request of the Navy.

Science News Letter, July 17, 1948

Sale . . .

FOR $1 PER COLLECTION OF 3 UNITS (was $1.50)

we will send you, postpaid, any collection of THINGS of science described below. Each unit has, in addition to science objects, its own leaflet of description with many experiments suggested. Museum-style legend cards are provided with each exhibit.

A LIGHT COLLECTION

A mineral that makes you see double; a printed circuit; materials with which to assemble a dry cell—these are the exciting objects contained in the MINERAL OPTICS, ELECTRONIC and DRY CELL UNITS making up this collection. Among the 20 specimens contained in this group are a subminiature tube, light sensitive cell, iceland spar and labradorite. A factory-assembled dry cell and the materials needed to make one at home—zinc can, wrapped bobbin, bottom washer, top collar, sealing compound and label—are included along with a tiny flashlight bulb, litmus paper, wire, iron rod and filings with which to perform experiments.

B COLOR COLLECTION

Paints that glow in the dark; red and green plastic sheets that together cut out all light; brilliant dyes obtained from plant roots —these and many other intriguing specimens are contained in the PHOSPHORESCENCE, PLASTIC PILOT AIDS and VEGETABLE DYES UNITS which make this colorful collection. There are fourteen specimens in all, including blind flying sheeting in red and green, dimout blue sheeting, ultra violet transmitting sheeting, phosphorescence plastic, tape, pigment, paint, madder, indigo, tumeric and alum.

C MINERAL COLLECTION

Stones showing the original structure of trees that grew millions of years ago; vacuum tube insulator made from one of the softest known minerals; rock containing traces of native sulfur—these are the surprising subjects in the PETRIFIED WOOD, TALC and SULFUR UNITS making up this collection. In the three boxes there are seventeen specimens, including petrified sweetgum, redwood, oak, elm and bog, fired and natural talc, sulfur-bearing limestone, iron sulfide, zinc sulfide, crude sulfur and flowers of sulfur.

D UNUSUAL MATERIALS COLLECTION

Porous cushioning material for upholstery; glass-enclosed air cells used to keep out heat or cold; zinc made fine-grained by incorporation of only 0.05% lithium—these materials of industrial importance are contained in the HOUSING, HOME AND OFFICE and LITHIUM UNITS. The eighteen specimens contained in these three blue boxes include wood-fiber wallboard, plywood, glass fiber fabric, coffee measure, airfoam, plastic and wire screening, shaver head, natural spodumine, lithium chloride, lithium nitride, pure zinc, zinc and lithium master alloy, and lithium-treated zinc.

E FIBER COLLECTION

Synthetic fiber made from skim milk; twisted rayon cord used in auto tires; glass fibers less than three ten-thousandths of an inch in diameter—these are the interesting subjects of the CASEIN, RAYON and GLASS FIBER UNITS that will be sent to those selecting this collection. In the three boxes that make up this series of exhibits there are fifteen specimens, including casein powder, raw fiber spun from casein, aralac, soft glass fiber, cotton linters, chemical cotton pulp, rayon tire cord and rayon fabric lining material.

F PLASTIC COLLECTION

Film with a seam that is stronger than the plastic itself; plastic plate with which you can print a bit of illustration or writing; plastic-coated yarn for crocheting or braiding a design—these are the rewarding specimens contained in VINYL PLASTIC FILM, PLASTICS IN PRINTING and PLASTIC COATED YARN UNITS which comprise this unusual scientific collection. There are 20 specimens, including vinyl plastic film, heat sealed seam, spot welded ruffle, plasting printing plate, moisture-proof sheeting, twist leaflet binding, plastic-coated yarn, flame-retardant webbing and fine fabric.

G TEXTILE COLLECTION

Raw material from which you can make a length of synthetic fiber; complete boll of fluffy white cotton; dye that enables you to identify different types of textiles—you have examples of both natural and synthetic fibers and a means of identifying them in the VINYL RESIN FIBER, COTTON and TEXTILE IDENTIFICATION UNITS. Twenty-two specimens make up this varied display, including vinyl resin, unstretched vinyl resin yarn, filter cloth, sailcloth, waterproof felt, tea bag, cotton boll, cotton that is tinted brown and green by nature, a differential dye and several swatches of different types of fabric to show how to distinguish cotton from silk, rayon and wool.

SPECIAL PRIORITY OFFER

Members of THINGS of science receive a surprise blue package each month, actual samples of the new and unusual. Although membership is limited to 10,000, we have a few vacancies open which you, as a subscriber to Science News Letter, are eligible to fill. If you would like to receive THINGS of science every month for one year (12 units in all), enclose $4 with this order and receive also a gift unit. If the present vacancies should be filled before your order is received, we will mail you the gift unit and enter your subscription as soon as a vacancy occurs.

ORDER TODAY

To: SCIENCE SERVICE, 1719 N Street, N.W., Washington 6, D. C.

For the enclosed $..... please send me postpaid, the collections of THINGS of science units checked below, at $1.00 per collection.

☐ I enclose also $4 for one year's membership (12 monthly units) plus the gift unit.

..... (A) LIGHT
..... (B) COLOR
..... (C) MINERAL
..... (D) UNUSUAL MATERIALS
..... (E) FIBER
..... (F) PLASTIC
..... (G) TEXTILE
..... ONE YEAR MEMBERSHIP

Name .....

Street .....

City, Zone, State .....

7-17

Books of the Week

TO SERVE YOU: To get books, send us a check or money order to cover retail price. Address Book Dept., SCIENCE NEWS LETTER, 1719 N St., N. W., Washington 6, D. C. Ask for free publications direct from issuing organizations.

THE AUTOBIOGRAPHY OF AN EX-COLOURED MAN: The Vivid Story of a Negro Who Crossed the Colour Line—James Weldon Johnson—*New American Library*, 142 p., paper, 35 cents. Reprint of a book originally written anonymously and published by Knopf. The author was a Negro, but the book is not, actually, autobiographical; that being merely a device to call attention to the illogical character of race prejudice.

CANADIAN JOURNAL OF MATHEMATICS (Journal Canadien de Mathematiques), Vol. I, No. 1—H. S. M. Coxeter, Editor-in-Chief—*University of Toronto Press*, quarterly, $6.00 per year or $3.00 to members of certain mathematical associations.

DISTILLATION AND RECTIFICATION—Emil Kirschbaum—*Chemical Publishing Co.*, 426 p., illus., $10.00. The first English edition of a book of interest especially to those in the distillation industry. Translated by M. Wolfinghoff.

EDUCATION IN HAITI—Mercer Cook—*Govt. Printing Office*, 90 p., illus., paper, 25 cents.

ENJOY YOUR CHILD—AGES 1, 2, AND 3—James L. Hymes, Jr.—*Public Affairs Committee*, 32 p., illus., 20 cents. Useful hints on how to do what is right for your young child and still have fun with him.

GENERAL ENDOCRINOLOGY—C. Donnell Turner—*Saunders*, 604 p., illus., $6.75. A textbook presented as a fundamental aspect of biologic science rather than as a medical specialty.

HEATING, VENTILATING, AIR CONDITIONING GUIDE, 1948—*American Society of Heating and Ventilating Engineers*, 1280 p., illus., $7.50. Containing technical and reference material, a manufacturers' catalog section, and a membership list of the Society.

INORGANIC PROCESS INDUSTRIES—Kenneth A. Kobe—*Macmillan*, 371 p., illus., $6.00. A textbook containing basic information about these important chemical industries.

NEW HANDBOOK OF THE HEAVENS—Hubert J. Bernhard, Dorothy A. Bennett and Hugh S. Rice—*McGraw-Hill*, rev. ed., 360 p., illus., $3.00. Written by and for people who enjoy the stars. The first edition from which this is re-written was the work of members of the Junior Astronomy Club.

NEW TELEVISION: The Magic Screen—Raymond F. Yates—*Didier*, 175 p., illus., $2.75. A simple explanation for laymen of a complicated commonplace.

ORGANIZATION AND MANAGEMENT: Selected Papers—Chester I. Barnard—*Harvard University Press*, 244 p., $4.00. The author, who is president of N. J. Bell Telephone Co., is also co-author of the State Department Report on International Control of Atomic Energy. He gives here his impressions of different kinds of private and public organization.

PARTICIPATION OF THE UNITED STATES GOVERNMENT IN INTERNATIONAL CONFERENCES, July 1, 1946-June 30, 1947—Department of State—*Govt. Printing Office*, 373 p., paper, 65 cents. International conferences attended by U. S. delegates will probably number 450 in 1948 as compared with an average of 75 annually before World War II. Those summarized in this volume include many on science and related topics.

PROJECTIVE METHODS—Lawrence K. Frank—*Thomas*, 86 p., $2.75. A lecture intended to direct the attention of students and others to the various methods for studying personality by permitting the individual to "read into" various neutral situations his own characteristic interpretations.

THE SONGS OF INSECTS: With Related Material on the Production, Detection, and Measurement of Sonic and Supersonic Vibrations—George W. Pierce—*Harvard University Press*, 329 p., illus., $5.00. Those concerned with sound and supersonic signalling have a particular interest in the sounds of insects, many of which are outside the range of human hearing. Thus, this investigation from the physics laboratory at Harvard.

YELLOWSTONE—ITS UNDERWORLD: Geology and Historical Anecdotes of Our Oldest National Park—Clyde **Max Bauer**—*University of New Mexico Press*, 122 p., illus., $2.00. A geologist of the National Park Service is author of this beautifully illustrated little book which gives informal answers to tourists and others who are curious as to what lies under the lovely scenery of Yellowstone.

Science News Letter, July 17, 1948

ENTOMOLOGY

Insects Menace Crops

➤ GRASSHOPPER HORDES are threatening crops in the northern Lake states and nearby prairie regions, reports from field entomologists to U. S. Department of Agriculture headquarters indicate. Wheat and the other small grains are largely out of harm's way, but corn and soybeans still have many weeks to go before they are "made," as have later cuttings of alfalfa and other hay crops.

Principal 'hopper concentrations are in Michigan, Illinois and Wisconsin, with the situation nearly as serious in Iowa and Minnesota, states W. A. Baker of the Bureau of Entomology and Plant Quarantine. Curiously enough, in the "chronic" grasshopper regions farther west and southwest the insects are not particularly troublesome, except for spotty outbreaks in South Dakota, Oklahoma and Arizona.

Severity of the grasshopper menace in the northern Midwest is believed to be due to the long drought of spring and early summer, which favored hatching and early survival. Rains in May and June, which usually beat a large proportion of the new-hatched 'hoppers into the ground, failed to materialize. At the same time, the drought checked the growth of wild vegetation on which grasshoppers normally do much of their feeding, and thus induced them to turn more towards cultivated plants.

Moderate to heavy rains over most of the threatened area within the past week or two found the grasshoppers too big to drown or pound into the ground. However, by encouraging the growth of wild vegetation they did some indirect good by diverting the insects' attention from the crops.

New counter-measures are receiving their first large-scale tryouts in the affected region. In place of the older sodium arsenite and sodium fluoride in bran-sawdust baits, two new organic chlorine compounds, Chlordane and chlorinated camphene or Toxaphene, are being sprayed or dusted directly on the vegetation. Another, benzene hexachloride, seems better adapted to use mixed with bait. Much still needs to be learned about all of these new weapons, however, Mr. Baker stated. Thus far their performance has been rather uneven; sometimes good, sometimes not so good. Factors still uninvestigated, like temperature or light, may affect the potency of the poisons in field use.

Chinch-bugs, usually grasshoppers' companions in evil-doing, have been quiescent so far, Mr. Baker reported. There have been some spotty outbreaks in Oklahoma and Missouri, but no mass activity. Benzene hexachloride and Chlordane have been used experimentally on the bugs where they could be found, but until real swarms of them appear somewhere it will not be possible to determine the anti-chinch-bug value of these new insecticides. The entomologists are waiting, and the first few billion chinch-bugs are likely to have a rough time of it.

Science News Letter, July 17, 1948

PSYCHOLOGY

Communism Is Poor Issue In Political Campaign

➤ COMMUNISM will not be an issue in the coming political campaign if the leading candidates follow the psychological advice of Robert C. Myers, visiting lecturer at Princeton University. Mr. Myers discussed political psychology as guest of Watson Davis, director of Science Service, on Adventures in Science heard over the Columbia network.

It is not that the American people do not hate communism, but just that all are agreed in finding it very bad. It would not be plausible to tag an opponent as an agent of communism, or for each to claim that he is against it.

"It would be as silly," Mr. Myers said, "as if every candidate for office in the dairy state of Wisconsin should hang his campaign on the fact that he was distinguished because he hated oleomargarine—and hated it with a fervor greater than that of any of his opponents."

Psychologically, a political campaign is very much like the "thriller" melodramas of the old days, Mr. Myers indicated. The skillful campaigner finds out in advance what things his audience is most likely to hate and fear, and he casts these things in the role of the villain.

The villains may be high taxes, war, insufferable bureaucracy, communism, immorality, political corruption—or even civil liberties, Mr. Myers indicated. The political opponents are cleverly made to seem to personify these villains.

The candidate himself is, of course, the hero, the "knight in shining armor" who will save the voter from being ravaged by the villains and by their agents, dupes or accomplices.

That puts the voter in the role of the heroine.

"At this point the heroine—that is, the audience—should come in for a great deal of praise. Its worthwhileness and virtues should be painted in the brightest colors. Each member of the audience should be made to feel his extreme worth, and how horrible it would really be if any of the villains should actually win out, and how lucky he is to have a man before him who is ready to fight for him and save him from a fate worse than death."

But now the campaigner has worked himself into a bad position. For the beautiful heroine ordinarily does nothing to save herself. It is the hero who acts. How is he to get the voter to the polls?

"To bring this about calls for extremely fast footwork," Mr. Myers explains, "and our campaigner must skillfully and smoothly pull off what we may call a 'switch.' He must subtly and adroitly switch roles with the audience so that at election time, the audience members will be the heroes, and he the heroine who must be saved from his opponents by the votes which the audience members must cast."

Science News Letter, July 17, 1948

ZOOLOGY

Wolves Studied by Leading Soviet Zoologist

➤ WOLVES (the kind that howl, not the ones that whistle) are the special subjects of study of Prof. A. Kohts of the Darwin Museum, one of Russia's leading zoologists, according to word received indirectly from Moscow. He has had especially good opportunities to build up his collection lately, because of the increase of the wildlife population of the USSR that followed the war's devastation.

The wolf species of northern Europe and Asia is identical with that of North America, Prof. Kohts declares. Differences are mainly in coat color. While North American wolves are gray, European wolves have a range of color from practically black in Spain to a sandy hue in the solitary wolves of the Arabian desert. Wolves of the cold Tibetan plateau, he adds, have woolly coats.

Science News Letter, July 17, 1948

• New Machines and Gadgets •

If you want more information on the new things described here, send a three-cent stamp to SCIENCE NEWS LETTER, 1719 N St., Washington 6, D. C. and ask for Gadget Bulletin 423. To receive this Gadget Bulletin without special request each week, remit $1.50 for one year's subscription.

⚙ *CONVERTIBLE FURNACE for home heating, which burns either coal or oil, has two combustion chambers which are united in a compact, streamlined jacket. Conversion is effected by the flip of a switch; its electric control damper automatically shuts off one unit when converting to the other fuel.*

Science News Letter, July 17, 1948

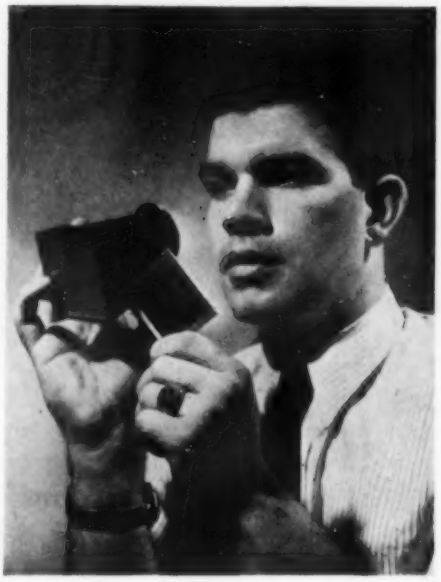
⚙ *AUTOMATIC BRAKE LOCK, which does not operate until the automobile has been brought to a full stop, holds the car even on a steep hill without the driver's foot on the brake pedal. It is designed for hydraulic shift transmission vehicles. Depression on the accelerator pedal releases the lock.*

Science News Letter, July 17, 1948

⚙ *MINIATURE GREENHOUSE for the plant fancier or hobbyist is approximately eight feet square and about six feet high at the eaves. The factory-built, metallic-framed structure has upper sidewalls and roof of a transparent cellulose plastic reinforced by wire mesh.*

Science News Letter, July 17, 1948

⚙ *VIEWER OF photographic films and transparencies is a light-weight plastic device, shown in the picture, with a ground glass back and an adjustable lens. Only the ordinary electric light bulb is needed for illumination; the viewer accommodates 2.25-inch-square transparencies and 35-mm. film in continuous lengths.*



Science News Letter, July 17, 1948

⚙ *INDIVIDUAL LOUD SPEAKER, for use in drive-in or open-air theaters where it is attached to the window frame inside the car, has a pad of glass fiber packed inside its cast aluminum shell which contributes to the quality of sound reproduction by reducing echo. Each speaker has its own volume control.*

Science News Letter, July 17, 1948

⚙ *JARS, VIALS and other containers, made of a special plastic, are particularly suitable for packaging wet, oily, acidic materials as well as dry products sensitive to moisture. The plastic used is lighter than glass, non-breakable, durable, odorless, tasteless, and highly resistant to strong acids, even to hydrofluoric acid.*

Science News Letter, July 17, 1948

⚙ *LAVATORY unit for railroad cars, that requires only one square foot of space when recessed in the wall, combines a washbowl and a highly-efficient jet-flushing water closet. The washbowl is swung down into place for using by means of a finger latch, and the closet is controlled by a push button.*

Science News Letter, July 17, 1948

• Nature Ramblings *by Frank Thone* •

► RAGWEED, the cause of most late-summer and autumn hayfever, is due to begin shedding its poisonous pollen soon. The resulting storm of sneezes will resound first in the North, about the end of the first week in August, all the way from Montana and Wyoming to Pennsylvania and New England. The wave rolls southward with the season, reaching the latitude of Tennessee and Oklahoma at mid-month, and the Gulf states about the first of September. The ill weeds will continue maturing and shedding pollen until frost kills them.

That is, they will unless you kill them first. Ever since the ragweeds were recognized as the villains they are, there have been efforts to eradicate them, at least in urban areas. But until very recently the only way to fight them was to pull them up by hand or mow them down with scythes, so anti-ragweed campaigns could as a practical thing be waged only when underemployment threw a surplus of cheap labor on the market. When people were busy and prosperous, ragweed prospered, too, and was busy in its own nefarious way.

Rough-on-Ragweeds

Quantity production of the chemical weed-killer, 2,4-D, has made a revolutionary change in the method of fighting the ragweeds. Now, two men with a power sprayer can prevent more pollen than a score with scythes. It isn't even necessary to kill the ragweed outright; a solution of less than lethal strength will still abort the pollen. Since both of the common ragweed species, the low and the giant, are annuals they will die when frost hits them, anyway.

Although 2,4-D spraying makes mass killing of ragweed easy, it does not entirely do away with the older hand methods of combating the pestiferous plants. If there are ragweed patches so close to shrubbery, flower beds or vegetable gardens that drifting spray might harm valuable plants, the safer thing is to stick to hand-pulling or scythe-swinging.

Nor should you expect to rid your community entirely of hayfever by clearing it of pollen-producing weeds. Ragweed pollen is dry and light, so that it will float in from rural fields and roadsides on even light breezes. Nevertheless, it is desirable to abate the nuisance as much as possible, for esthetic reasons as well as to diminish the discomfort of hayfever sufferers.

Science News Letter, July 17, 1948